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Channeling Federal Water: The Acreage Question

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Costs of Producing Major Crops

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Perspectives

Boosted by better returns for hogs, soybeans, corn, broilers, potatoes, and cattle, average prices received by farmers climbed more than 5 percent during the month that ended in mid-July. The increase put USDA's index of farmers' prices even with the year-earlier level for the first time since January.

Hot, dry weather cut sharply into crop prospects and forced up crop prices. On the livestock side, cash receipts improved markedly from depressed spring returns.

The 1980 corn crop may total 6.65 billion bushels, says the August Crop Reporting Board summary. That's 9% less than the July forecast and 14% under last year's record 7.76 billion. The average yield is put at 93 bushels an acre, 6 bushels short of July and more than 16 under last season's high mark.

The soybean crop is forecast at 1.88 billion bushels, 17% smaller than the 1979 crop, with average yields down almost 5 bushels an acre. Cotton production of 12.8 million bales would be 12% less than in 1979.

The rebuilding phase of the cattle cycle is now underway. USDA's midyear inventory tallied 123 million cattle and calves, 4 percent more than a year before and the first July-to-July expansion in 5 years. Another survey showed fewer cattle in feedlots this July than any July since 1975. However, placements are expected to reach more normal levels with the improved livestock price picture.

The present pace of U.S. exports could push total sales above the forecast $38 billion--to $40 billion maybe--for the year ending September 30. That compares with $32 billion last year. In late July, the Soviets returned to the U.S. marketplace for 100,000 metric tons each of corn and wheat, their first purchase since the partial grain embargo began. USDA's "most likely" estimate of total Soviet 1980 grain output was lowered to 210 million tons, well below their planned target of 235 million.

Despite improved farm prices and strong exports, net farm income may finish 1980 a fourth or more short of 1979's newly revised $31 billion. The culprit remains rapidly rising production expenses--now projected to increase 10 to 12 percent over last year, more than offsetting the 4 to 6 percent gain expected in cash receipts. This climb in production expenses comes on the heels of last year's 18-percent boost, the largest increase since 1973.

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"New Equilibrium" May Brighten 1980s' Farm Outlook 7

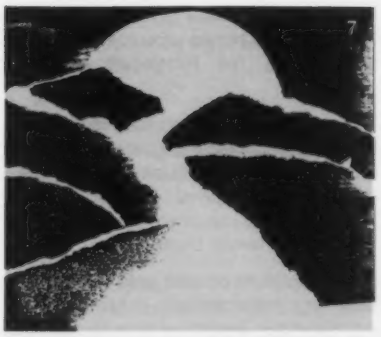
Farmers' self-sufficiency may continue giving way to increasing specialization in the eighties, but a new equilibrium of food supply and demand could put them in a stronger economic position.

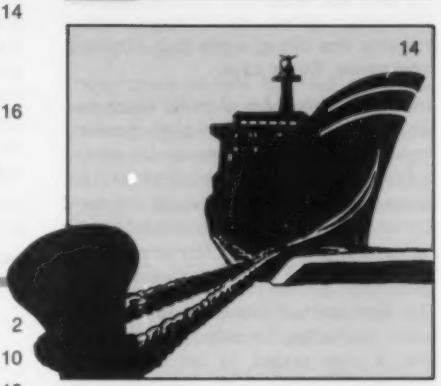
Farm Exports Green Up U.S. Economy 14

Farmers aren't the only ones who benefit from farm trade. Agricultural exports also pump badly needed jobs and money into the U.S. economy.

Top Contenders for Productivity Breakthroughs 16

Scientists look to cattle twinning, photosynthetic enhancement, and bioregulation as the three most promising technologies for increasing farm productivity in years ahead.





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Channeling Federal Water: The Acreage Limit Question

More than water is at stake in the current debate over new acreage limitations for irrigated western farmland.

Lawmakers must try to resolve the sometimes conflicting goals of farm efficiency and equitable access to irrigation water supplied by the federal government, according to USDA economist Harold Stults.

Their decisions on who gets the water—and on enforcement policies—could have a major impact on farm sizes in the 17 western states, where federal water irrigates one out of every four irrigated farm acres, Stults says.

The Reclamation Act of 1902, which established the federal water system, limited the number of acres for which federal water can be provided to 160 acres per owner (a farm couple can own 320 acres). The aim was to protect family farms and give smaller farmers access to irrigated land in the arid west.

The limit worked because government water was often the only water around, and it was priced to be affordable. However, some farm owners now irrigate very large farms because administrative practices permitted unlimited leasing and loose multiple ownership arrangements, and because, in some instances, enforcement was lax.

Legislation Pending

Calls for stricter enforcement of the 160-acre limit, pressed initially through court cases, led in turn to a fresh examination of the limit itself, and whether it's suited to modern farming. Legislation now pending in both houses of Congress would expand the size of farms entitled to federal water, Stults explains.

The Senate passed a bill in September 1979 increasing the limit to 1,280 acres for a farming operation, including owned and leased land. In June 1980, the House Committee on Interior and Insular Affairs recommended a bill increasing the limit to 960 acres, and allowing up to 2,400 more acres to be leased under certain conditions.

As lawmakers debate these bills, they'll be considering some of the issues raised in a recent joint report by the Interior Department and USDA's Economics, Statistics, and Cooperatives Service.

The report examined the economic and environmental consequences of increasing the 160-acre limit for farmland receiving water through 150 federal irrigation projects. About 10 million acres of farmland can receive irrigation water from these projects, which are administered by the Water and Power Resources Service (formerly the Bureau of Reclamation) of the U.S. Department of the Interior.

"Most western farmers already comply with the current acreage limitation," says Stults, "but a large amount of land does not." The explanation: concentration of large acreages in relatively few hands.

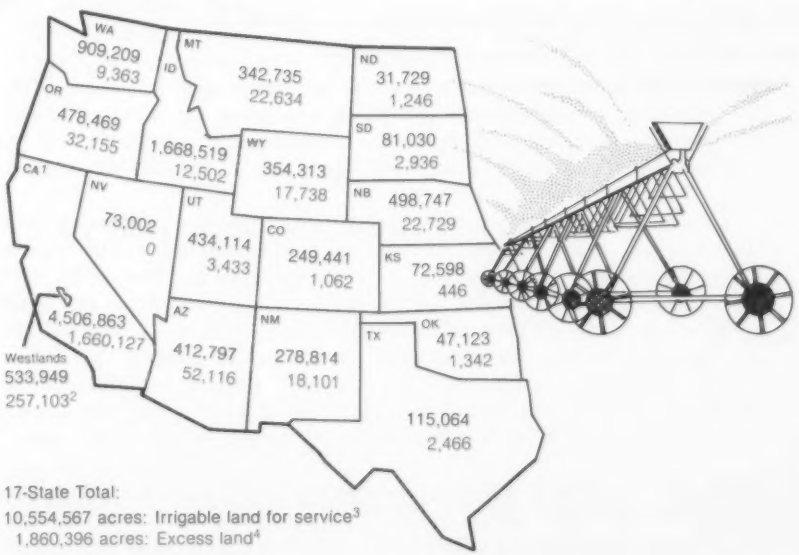
Landownership Patterns Now

About 126,000 individuals own 8.8 million irrigated acres subject to the acreage limitation provisions. Almost 91 percent own no more than 160 acres, and 98 percent own no more than 320 acres.

However, about 2 percent of the owners, who do own more than 320 acres each, have title to 27 percent of the land. And about 340 landowners (less than a third of 1 percent of all owners) own 11 percent of all the land in federal water projects.

So, while only a small percentage of owners would be affected by enforcement of the current acreage limit, a substantial

Nearly Two Million Acres Exceed Limit, Though Owners Rely on Subsidized Federal Water



17-State Total:

10,554,567 acres: Irrigable land for service[3]
1,860,396 acres: Excess land[4]

[1]Figures include Imperial irrigation district.
[2]Of these acres, 217,714 are under recordable contract to be sold to eligible owners.
[3]Land in districts capable of receiving federal project water, excluding acres exempt from limitations and acres to which special provisions of law apply.
[4]Acreage in excess of that allowed by the Reclamation Act of 1902, which set a limit of 160 acres per owner.

A central question is whether the largest farmers should get the largest benefits of federal subsidies or whether federal policies should ensure that smaller farm families can participate in irrigated farming in these areas.

portion of the land could be divided into smaller units or lose access to federal water.

The new legislation may put a cap on farm size, as well as on the amount of land per owner entitled to receive federal water. This could put additional farms in violation of the legal limits, since a pattern of concentration is also apparent in figures on farm units.

The farmland owned by the 126,000 individual owners is operated in 47,600 farm units. One farm may represent various multiple ownership arrangements, and a farm operator may lease land from other landowners.

About 75 percent of the farm operations are 160 acres or less, but they encompass only 23 percent of the land. They would not be affected by changes in the acreage limitations for individual farm units. However, while only 3 percent of the farms would be in violation if the limitation on farm units is set at 960 acres, 31 percent of the land would still exceed the maximum.

The 435 largest operations control about 1.6 million acres or 19 percent of all land. That's an average of 3,679 acres per farm. These farms would be most affected by enforcement of the proposed acreage limits.

An area with a large amount of land in excess of 160 acres per individual owner is the Westlands district in California. It's also the largest water district, with 580,000 acres and some of the largest farms. About 35 percent of the land is concentrated in the hands of only 19 owners.

The Imperial Valley in California is another district with very large and concentrated land holdings. However, the Supreme Court ruled in June 1980 that the 160-acre limitation does not apply to the Imperial Valley because farmers had valid water rights before the federal water project was established there.

New Acreage Limitations

What has happened in western states simply reflects the U.S. trend in recent decades toward fewer and larger farms, with production increasingly concentrated among the largest operators. Pressures to increase farm size will continue so long as net farm income is related to farm size.

However, policymakers setting new acreage limitations and reconsidering other aspects of federal reclamation law are determining how federal water should be used.

A central question is whether the largest farmers should get subsidies built into the federal investment or whether federal policies should encourage a more equitable distribution of land to ensure that smaller family farmers can participate in irrigated farming in these areas.

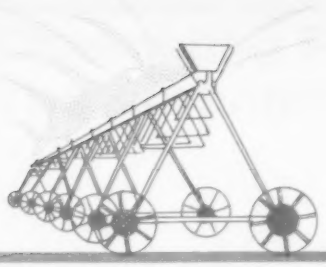
How would an increase in the acreage limitation to 960 acres, along with strict enforcement, affect the number and size of farms in federally irrigated lands? According to Stults:

- An increased acreage limitation would allow some small and middle-size farmers to expand, perhaps buying up some small farms as they come on the market, in keeping with the national trend toward fewer but larger farms.
- Where farms exceed even the increased acreage limitation, they would be broken up and some of the land distributed to family members or sold off. In these areas, the number of farms and farmers would increase.

Thus, there would be two counterbalancing effects: a tendency toward fewer farms in some areas as small and middle-sized farmers buy or operate more land, with more land becoming available in other areas as the largest farms sell off acreage.

Of course, one problem with breaking up large holdings and selling them off is that other barriers exist for new farmers trying to get started in agriculture.

Even with subsidized water, new farmers face high land values, high interest rates, and big capital investment costs, just as they do anywhere in the U.S. Special resources, such as farm loans from the Farmer Home Administration, could increase opportunities for new farmers.



Both Efficiency and Equity

The prospect of setting new acreage limits relevant to today's farming raises two issues—efficiency and equity. Will selling off large holdings to make new and smaller farms cause a loss of farming efficiency? Some people argue it will.

USDA economists analyzed 18 case study districts typical of the districts in the 17 states receiving federal water, and determined that almost all of the farms could achieve near peak efficiency with 960 acres or less.

The analysts concluded that 960 acres are adequate for just about any kind of farm to provide a family with an efficient operation and a reasonable cash flow. In the case study, most farms reached 98 percent of the potential economies of scale in the 320 to 620 acre range.

Although efficient farm sizes vary, farms smaller than 960 acres give reasonable returns to the farm family, and in most districts less than 500 acres of irrigated cropland can produce a $20,000 cash flow. This means that breaking up farms larger than 960 acres to create smaller ones would cause little or no loss in efficiency.

Farm efficiency and equity are related. Taking the equity goal to its extreme would result in a large number of small farms that couldn't provide enough cash flow to cover their costs and still support a farm family.

Of course, the size of a farm needed to achieve efficient production and provide adequate returns for family living varies widely from one region to another.

For example, an intensive crop such as avocados grown in California may require only 30 acres of irrigated land to support a family. However, a farmer irrigating hay or pasture in Montana requires several hundred acres to achieve farm efficiency and support a family.

The questions of farm efficiency and equity are related. The original Reclamation Act of 1902 aimed to distribute as widely as possible the benefits of federal water projects.

But taking this goal to its extreme would result in a large number of small farms that could not provide enough cash flow to cover costs and contribute to family living expenses. Thus, the equity goal is restricted by the question of efficient farm size.

Less Than 500 Acres Can Produce $20,000 Return in Most Districts

Case study districts	Minimum acreage required to achieve an annual return[1] of:		
	$10,000	$15,000	$20,000
	acres		
Extensive forage crops			
Milk River, Mont.	290	430	525
Moon Lake, Utah	255	330	400
Forage, cereals, field crops			
Truckee-Carson, Nev.	140	160	275
Grand Valley, Colo.	160	200	300
Farwell, Nebr.	210	265	310
Goshen, Wyo.	180	200	230
Lugert-Altus, Okla.	[2]	[2]	[2]
Black Canyon, Idaho	280	400	620
Lower Yellowstone, Mont.	215	270	335
Glenn-Colusa, Calif.	120	140	150
Field crops, vegetables			
Columbia Basin, East District, Wash.	100	125	135
Westlands, Calif.			
With pump	230	590	720
Without pump	170	250	320
Elephant Butte, N. Mex.	40	60	80
Imperial, Calif.			
Light soil	190	240	260
Heavy soil	250	280	310
Wellton-Mohawk, Ariz.	160	175	210
Perennial crops			
Oroville-Tonasket, Wash.	23	26	29
Coachella, Calif.	38	77	150
Goleta, Calif.	23	25	30

[1] Annual return to unpaid family labor, management, and equity after meeting all production expenses, based on an optimized crop mix under excess land value, beginning farmer. [2] Not possible to achieve this return under assumed prices, yields, and institutional constraints.

"New Equilibrium" May Brighten 1980s' Farm Outlook

American agriculture in the 1980's may enter an era in which farmers will be less and less self-sufficient but, possibly, in an increasingly strong economic position as 60 years of chronic oversupply of farm products ends.

For farmers who value both their independence and financial solvency, this picture is one of concern mixed with optimism. And it's one that reflects the growing complexity of American agriculture, according to John E. Lee, director of the National Economics Division of USDA's Economics, Statistics, and Cooperatives Service.

Traditional farm self-sufficiency has already given way to increasing specialization in which nonfarmers provide custom services which farmers used to perform themselves. To a degree, specialization has also meant a growing separation of farming from farmland ownership.

In other words, the farmer has become more and more an agricultural production specialist who depends on the talents and resources of others to produce farm commodities.

Agricultural Upheaval

Both the advent of specialization and the end of overproduction—the "new equilibrium" of food supply and demand, as Lee calls it—are rooted in a structural upheaval that has quietly but mightily shaken U.S. agriculture in the past few decades.

While specialization and the new equilibrium would perhaps most directly affect farming, they're by no means the only strong forces which Lee sees on the horizon for the 1980's. He identifies four broad areas of expected change during the decade which may greatly affect agricultural policy decisions:

- A changed economic structure and character of U.S. agriculture—including increasing concentration of the bulk of commercial farm production in the hands of a few hundred thousand large farmers, leaving a larger number of small farmers whose fortunes are diverse but only tangentially linked to agriculture in most cases.

A "new equilibrium" of supply and demand for U.S. farm production should result in stronger farm prices before the middle of this decade.

All of this means that traditional government policies are coming under scrutiny to see if they square with the reality of American agriculture and the needs of its constituents.

- The continuing importance of international markets to U.S. agriculture—and of U.S. agriculture to international markets. This will greatly affect domestic farm and food policy, as well as impact heavily on international relations.
- The new equilibrium of supply and demand in U.S. agricultural production.
- "The new, broadened context within which agricultural policies and programs must be considered," Lee says. This means that the most basic interests of the nation and the world have become increasingly entwined with what happens in America's agricultural heartland.

"New Equilibrium" Due

From the farmer's viewpoint, the most attractive development, by far, is the new equilibrium which should result in stronger farm prices before the middle of this decade.

Since World War I, the "farm problem" has been that of handling "excess resources, excess production, depressed prices, and depressed returns and incomes for a farm sector composed of millions of small farmers, mostly poor, and with inadequate access to credit and capital," Lee says.

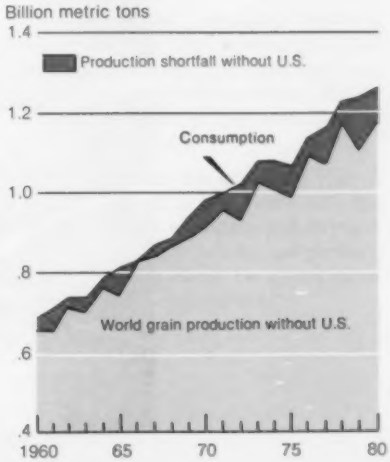
The economist noted that the technological revolution benefited the consumer much more than the farmer by boosting production above consumption. In its wake, it left a great migration to cities as millions of farm people were displaced by technology.

Oversupply Is Ending

"Now there are growing indications that the 60-year period of adjustment is about over," Lee contends, as he lists this evidence:

- Global food production is expected to grow more slowly than in past years. Most prime cropland is already in use, so production gains must come from greater productivity at a time when energy-based inputs are becoming much more costly.
- Global food demand should grow strongly, as world population grows, the world economy improves, and Third World buying power strengthens.
- Demand for U.S. products in world markets should expand, since there are only a few major food exporting countries to meet these needs—the foremost being the U.S.

World Grain Shortfall Grows Without U.S. Production



1980 estimated.

Today, 125,000 farms out of 2.3 million produce about half of the total value of all farm products. By the year 2000, projections suggest that 75,000 farms will produce half the U.S. farm output.

On the homefront, indications are that keeping up with growing world demand will present a challenge for U.S. agriculture. The most productive land is already in use; productivity gains have slowed; cropland can be increased, but only at higher dollar and environmental costs; sharply higher costs may curtail the use of yield-increasing chemicals and energy; and interest is rising in producing crops for energy uses—factors that may slow the growth of U.S. agriculture's capacity to produce food.

Mixed Blessings

For policymakers, the spectre of American agriculture straining just to keep up with demand offers mixed blessings. On one hand, the lingering "farm problem" would largely disappear. But, on the other, a myriad of new problems arise, ranging from land use and environmental tradeoffs of basic domestic and international policy questions.

The bottom line is higher farm prices for U.S. farmers. But Lee cautions that the benefits may be eroded by inflation and spread unequally among farmers, depending on such factors as the size of operation.

Touching the Heart

While international exports, the supply-demand equilibrium, and policy factors will certainly touch the American farmer's life—and pocketbook—during the 1980's, the potential changes in the way farming is organized may touch the farmer's heart.

Independence and self-reliance, values held dear by many farmers, are rooted deeply in land ownership—a practice which is growing far too rich for the blood of many who would be farmers.

Farmland ownership is becoming increasingly concentrated, as farmers who are able expand to gain higher production and income. In 1979, 1 percent of all farmland owners owned 30 percent of American farmland—and the concentration trend continues.

As farmland prices rise, only large, well-established farm owners can afford the land, so production, too, becomes concentrated.

Today, 125,000 farms—out of 2.3 million U.S. farms—produce about half of the total value of all farm production. By the year 2000, projections suggest that 75,000 farms will produce half the U.S. farm output.

Farmers of course aren't the only buyers of land. Further pushing up farmland prices over the long run is the lure of land as an inflation hedge for outside investors.

Incentives To Keep Land

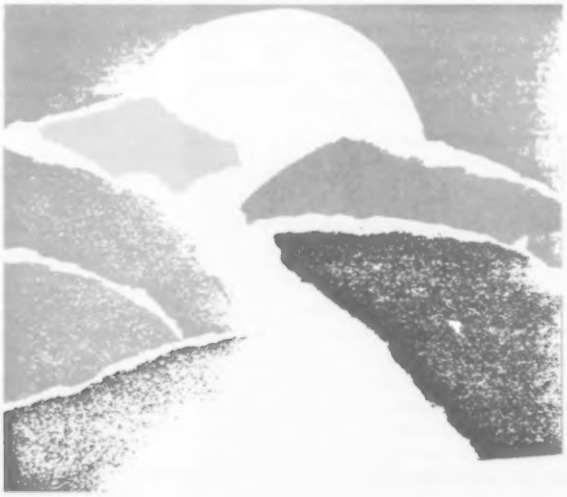
Besides incentives to acquire large farmland holdings, the trend toward consolidation is fed by disincentives for large landholders to sell. Tax and credit policies appear to contribute to the fewer-but-larger farms trend, Lee says, "in ways neither intended nor fully understood by policymakers."

Several recent federal tax provisions serve to discourage established owners from selling land. So, large holdings tend to remain intact, while smaller farms go on the market.

The cumulative effect, Lee says, is to "create a situation favoring increased separation of land ownership and land use." He explains that large holdings, even by working farmers, are frequently leased out to operators who can't afford to—or who prefer not to—own the land.

Land Ownership Specialized

"In other words," he continues, "some could specialize in land ownership and in seeking the returns to the ownership function, whereas others might concentrate on being farm operators.



"An agriculture largely characterized by specialization in resource ownership and use of resource services would be different in character from agriculture as we have known it."

"Such tenure arrangements no longer carry the social stigma they once did, and they do not imply economic disadvantage if the terms of trade between landowners and land users are equitable. Thus, the long-held value of the owner-operated family farm as a norm or structural goal could give way to economic pragmatism."

Lee takes specialization a step further than merely land ownership. He expects similar trends in other inputs areas. For example, an expensive or specialized piece of equipment could be owned by nonfarmers and leased to farmers or its services provided on a custom basis.

A large service industry already exists around the farm sector, performing now-specialized tasks that a few decades ago the farmer would have done himself. Rising costs of labor and equipment, and the efficiency that comes with specialization, make such contracting and custom services attractive.

Even Greater Specialization

"The potential for greater specialization in ownership of production assets versus use of asset services would be consistent with developments in other sectors of the economy and a continuation of a long-established trend toward functions once performed by farmers—and thought to be inseparable from farming—shifting to being performed by nonfarm specialists.

"There is nothing new in principle here," Lee declares. "But an agriculture largely characterized by specialization in resource ownership and use of resource services would be different in character from agriculture as we have known it."

Greater Debt Financing

Still another expected 1980's trend may worry farmers who are concerned about self-reliance: a continuing trend toward heavy debt financing—which impacts most on bigger operators.

While the overall ratio of debts to assets was about 17 percent last year, it was only about 5 percent for the smallest class of operators (those selling $2,500 or less), and better than 20 percent for the largest class of farms ($100,000 or more in farm product sales).

While larger operations are more deeply in debt, they're also more dependent on farm income to dig their way out. Largest class farms held nearly 40 percent of the total debt, but received only 6 percent of all off-farm income accruing to farm families in 1978.

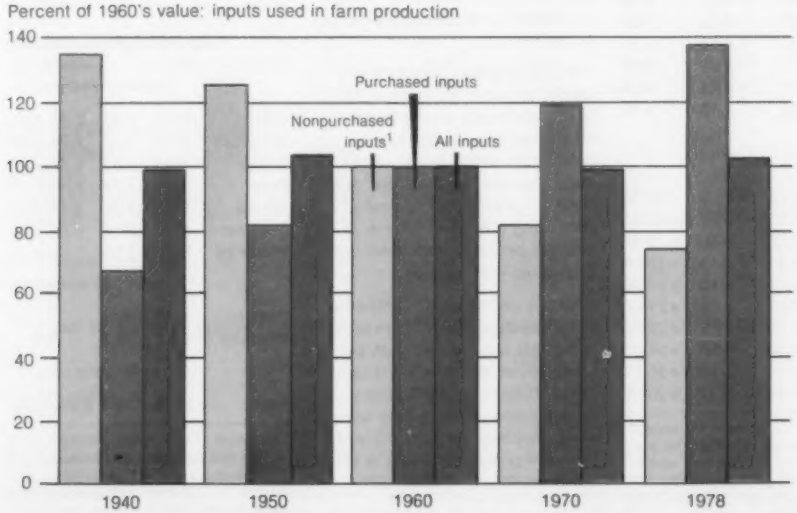
Larger Farms, Larger Debts

Smallest class farms took nearly half the off-farm income, while holding less than 4 percent of the total farm debt. The basic trend holds for the classes in between: Larger farms hold higher debts and lower off-farm income.

This may sound somewhat ominous unless it's put into perspective: The more farmers farm, the more they rely on farming for their livelihood. A full-time farmer, then, is fully committed to accepting the risks.

Even so—despite the stumbling start of the farm economy this year—with the new equilibrium of supply and demand promising stronger prices, Lee predicts "that the 1980's could be a very good decade for U.S. agriculture."

Increasing Farm Specialization Reflected in Growing Reliance on Purchased Production Inputs



[1]Includes operator and unpaid family labor, operator-owned real estate, and other capital inputs.
1978 preliminary.

Crop Production Costs Taking Big Bite

USDA's latest cost-of-production report on 10 major U.S. crops (corn, sorghum, barley, oats, wheat, rice, soybeans, flaxseed, peanuts, and cotton) gives final figures for 1978, preliminary data for 1979, and projections for this year.

Data for these annual reports are based on producer surveys conducted by state statistical offices of the USDA's Crop Reporting Board.

Data from the report may differ greatly from a farmer's actual 1979 records because they are regional and national averages. The 1980 projections, still highly tentative, will undergo revisions in 1981 and 1982 as final data are collected and analyzed.

This year, producers of the major U.S. crops are feeling the bite of sharply rising production expenses.

Although costs are going up in nearly every segment of the production cycle, the biggest increases stem from higher fuel bills, interest rates, and fertilizer prices. The overall rise in production costs per acre is projected to range from 18 percent for cotton to 25.5 percent for rice.

In 1979, rice was at the low end of the production cost totem pole, with an increase of 12 percent from 1978. The largest rise was for grain sorghum—24 percent.

The variation in cost hikes among the major crops is rooted in the mix of imputs needed to produce them. For example, rice costs are expected to rise the most this year because of the more intensive energy needs—primarily for irrigation and drying.

Grain sorghum production—with a projected 1980 increase of 25 percent, just below rice—also consumes more energy than most crops, especially on irrigated cropland.

The costs estimated in USDA's annual report include management, general farm overhead (comprising record-keeping, utilities, and general farm maintenance), machinery ownership, and variable costs (expenses for seed, chemicals, fertilizers, labor, and fuel). Costs per unit of production (per bushel of corn, for example) are determined by dividing costs per acre by crop yields.

Production Costs For Major Crops Rise Sharply[1]

	1978	1979[2]	1980[3]	1978 to 1979	1979 to 1980
	dollars per planted acre			*percent change*	
Corn	149.38	173.49	215.13	+16	+24
Sorghum	96.69	119.69	149.11	+24	+25
Barley	92.30	108.44	133.15	+17	+23
Oats	72.90	84.57	102.88	+16	+22
Wheat	74.30	89.18	109.43	+20	+23
Rice	277.61	311.56	391.07	+12	+26
Soybeans	99.13	114.43	138.41	+15	+21
Flaxseed	57.19	68.44	82.76	+20	+21
Peanuts	376.51	424.53	525.41	+13	+24
Cotton	260.11	305.46	359.33	+17	+18
	dollars per unit[4]				
Corn (bu.)	1.49	1.59	2.00-2.35	+ 7	+26-48
Sorghum (bu.)	1.82	1.94	2.52-3.01	+ 7	+30-55
Barley (bu.)	2.01	2.26	2.85-3.26	+12	+26-44
Oats (bu.)	1.46	1.65	1.92-2.21	+13	+16-34
Wheat (bu.)	2.48	2.74	3.31-3.79	+10	+21-38
Rice (cwt.)	6.24	6.84	6.30-8.87	+10	+21-30
Soybeans (bu.)	3.39	3.59	4.37-4.89	+ 6	+22-36
Flaxseed (bu.)	4.61	5.35	7.26-10.34	+16	+36-93
Peanuts (lb.)	0.14	0.16	0.20-0.21	+14	+25-31
Cotton (lb.)	0.67	0.60	0.72-0.88	- 10	+20-47

[1] Nonland costs only. [2] Preliminary. [3] Projected. [4] Unit costs projected for 1980 reflect a yield range based on 15-year trend yields. Yields of most crops are expected to fall in 1980 from last year's levels—down 10 percent for corn, 12 percent for sorghum, 9 percent for barley, 2 percent for oats, 5 percent for all wheat, 6 percent for soybeans, 24 percent for flaxseed, and 11 percent for cotton. Yields for rice and peanuts are expected to show little change from 1979.

Much Depends on Yields

Last year, the high yields per acre of most crops helped to ease the increases in per-unit production costs. For cotton, with a record yield of 510 pounds of lint per acre, costs per pound of lint declined 10 percent even though production costs per acre were up 17 percent.

The problem this year is that if yields per acre fall short of 1979 levels, there will be nothing to offset the hikes in per-acre production costs. Lower yields seem increasingly likely for most major crops. Thus, the cost of producing a bushel, pound, or cwt. will probably rise even more than costs per acre.

Until the estimates of 1980 crop yields become firmer, there's little more that can be said with certainty about this year's per-unit costs. Therefore, the following crop summaries deal only with what happened to per-unit and per-acre production costs in 1979. Flaxseed is not covered.

USDA's report also estimates alternative costs for land reflecting the different perspectives of owners, renters, and new or established farmers. However, because of the detail involved, only nonland costs are reported here.

As long as supplies last, you can get a free copy of the complete report by writing to ESCS Information, USDA, Rm. 0054-South, Washington, D.C. 20250. Ask for *Costs of Producing Selected Crops in the United States—1978, 1979, and Projections for 1980.*

Record Yields Limit 1979 Corn Cost Rise

Last year, corn producers' costs per acre rose 16 percent over 1978, with costs highest in the southwest ($254) and lowest in the Northern Plains ($167).

However, with average yields up nearly 9 bushels to a record 109.2

Average Farm Prices for Major Crops

	1978/79	1979/80	1980/81[1]
	dollars per bushel		
Corn	2.25	2.41	2.45-2.85
Sorghum	2.02	2.25	2.25-2.80
Barley	1.92	2.31	2.30-2.60
Oats	1.20	1.36	1.40-1.65
Wheat	2.98	3.82	3.75-4.25
Soybeans	6.66	6.19	6.00-7.50
Flaxseed	5.74	5.96	n.a.
	cents per pound		
Cotton	58.4	62.6[2]	[3]
Peanuts	21.1	20.7	n.a.
	dollars per cwt.		
Rice	8.16	10.60	9.00-12.00

[1] Forecast. [2] Weighted average price for the first 8 months of the season; not a forecast for 1979/80. [3] USDA is prohibited by law from publishing cotton price projections. n.a.=not available.

bushels per acre, the cost of producing a bushel of corn rose only 7 percent nationwide.

Producers in the lake states and Corn Belt—accounting for 70 percent of U.S. corn production—had the lowest per-bushel costs in 1979, at $1.47, while those in the southwest had the highest costs, at $2.41 a bushel.

Costs in the southeast—the second highest cost region—declined slightly in 1979 due to recovery from the poor yields of 1978.

Sorghum Up 24 Percent Per Acre

Nationwide, per-acre production costs jumped 24 percent in 1979 to $119.69. However, with average yields up 8.4 bushels per acre, the average cost per bushel rose less than 7 percent to $1.94.

The cost of producing sorghum varies among regions mainly according to the degree of irrigation. In the Central Plains—where 60 percent of the 1979 sorghum crop was produced—only 16 percent of the land is irrigated, and production costs there were consequently lowest, about $110 an acre.

About 40 percent of the sorghum-growing area in the Southern Plains and nearly all of that in the southwest is irrigated, resulting in proportionally greater per-acre costs—$127 in the Southern Plains and $210 in the southwest.

Even though yields are highest in the southwest, the cost per bushel in 1979 was still highest there at $2.90, compared with $2.47 in the Southern Plains and $1.60 in the Central Plains.

Costs of Producing Corn in 1979

	North-east	Lake states and Corn Belt	Northern Plains	South-east	South-west	United States
			dollars per acre			
Variable costs:						
Seed	12.45	12.62	11.56	12.68	11.52	12.41
Fertilizer	42.07	40.00	23.28	48.77	35.17	37.95
Lime	1.35	1.23	.04	3.04	—	1.18
Chemicals[1]	14.68	14.58	9.05	13.50	21.24	13.67
Custom operations[2]	5.81	4.01	3.57	7.75	9.45	4.49
All labor	13.93	10.72	12.53	12.88	24.97	11.68
Fuel and lubrication	9.93	8.93	17.36	9.58	38.68	11.13
Repairs	7.67	7.42	11.03	6.94	15.06	8.17
Drying	5.72	8.16	4.24	3.87	4.42	6.90
Purchased irrigation water	—	—	.30	—	1.21	.08
Interest	4.20	4.28	3.60	4.63	6.07	4.23
Total variable	117.81	111.95	96.56	123.64	167.79	111.89
Machinery ownership:						
Replacement	19.42	20.12	26.63	18.26	30.35	21.26
Interest	12.11	12.59	17.59	10.53	18.92	13.37
Taxes and insurance	2.96	3.08	4.38	2.59	4.61	3.28
Total machinery	34.49	35.79	48.60	31.38	53.88	37.91
General farm overhead	13.07	7.67	6.73	9.52	9.57	7.92
Management[3]	16.54	15.54	15.19	16.45	23.12	15.77
Cost per acre, excluding land	181.91	170.95	167.08	180.99	254.36	173.49
			bushels per acre			
Average yield	92.3	115.9	105.3	77.8	105.6	109.2
			dollars per bushel			
Cost per bushel, excluding land	1.97	1.47	1.59	2.33	2.41	1.59

[1] Includes herbicides, insecticides, and rodenticides not otherwise included under custom operations. [2] Includes custom application of crop chemicals, the cost of chemicals in some cases, and custom harvesting and hauling. [3] Based on 10 percent of above costs.

Highest Per Bushel Barley Cost in Southwest

Barley growers in all regions faced higher costs per acre in 1979. Costs ranged from $154 in the southwest to $91 in the Northern Plains—where 49 percent of last year's crop was grown. Per-acre costs were up 17 percent nationwide from 1978.

Despite a record average U.S. yield of 48 bushels per acre, the cost of producing a bushel of barley still rose 12 percent to $2.26. Dramatic yield gains in the Southern Plains and southwest helped bring costs per bushel down somewhat in those regions, although costs rose in all others.

The Southern Plains had the lowest cost per bushel last year at $2.00, while the Northern Plains—which had the lowest cost in 1978—had the second-lowest cost at $2.09.

At $2.87, costs per bushel were highest in the southwest, where most of the barley is grown under irrigation.

Oat Outlays Rise in All Regions

Farmers' outlays in producing oats rose in 1979 for all regions on both a per-acre and per-bushel basis.

With national average costs per acre up 16 percent and yields up a modest 2 percent, the average cost per bushel of oats rose 13 percent from $1.46 to $1.65.

Costs continued to be highest in the northeast—$120 an acre and $2.16 a bushel—and lowest in the Northern Plains—$65 an acre and $1.50 a bushel.

The lake states and Corn Belt region—which accounted for about 50 percent of the 1979 oats crop—had costs of $95 an acre and $1.66 a bushel.

Wheat Up 10 Percent Per Bushel

For all wheat, costs were pushed up mainly by higher fuel, fertilizer, seed, and machinery prices. Per-acre costs for all wheat rose 20 percent, while costs per bushel increased 10 percent despite a large increase in yields. National average costs last year stood at $89 an acre and $2.74 a bushel.

For the different classes of wheat, average costs in 1979 were: hard red winter, $82.48 an acre and $2.51 a bushel; soft red winter, $111 an acre and $2.74 a bushel; durum, $83 an acre and $3.33 a bushel; hard red spring, $82.50 an acre and $3.16 a bushel; and white, $120.47 an acre and $2.95 a bushel.

Hard red winter wheat accounted for 51 percent of the total U.S. wheat crop last year.

California Low, Gulf High Per Cwt. of Rice

Because of new data obtained in a 1979 survey of producers in all major rice areas, some costs were revised downward. The revised estimates now take into account the percentage of green (not dried) rice sold in different regions, which reduced the effects of higher fuel prices in the cost of drying rice. Similar changes were made in general farm overhead costs and certain variable costs, such as custom harvesting.

As a result of these changes, per-acre production costs for rice showed a 12-percent increase in 1979, reflecting higher fuel prices and interest rates. Despite a record national yield of 45.5 cwt. per acre, costs per cwt. still rose 10 percent.

In California, however, where yields rose more than 24 percent to 64 cwt. per acre, costs per cwt. declined 10 percent from 1978 to $5.41. Thus, although California had the highest per-acre costs at $347, these growers had the lowest per-unit costs in 1979. At $8.18, costs per cwt. were highest in the Gulf coast region, where 30 percent of last year's crop was grown.

Soybean Yield Gains Trim Most Costs

Led by higher fuel and interest charges, U.S. soybean farmers spent 15 percent more per acre in 1979 than in 1978. However, with average yields up 9 percent from 1978 to a record 31.9 bushels per acre, production costs per bushel rose only 6 percent to $3.59.

Costs of Producing Soybeans in 1979

	Lake states and Corn Belt	Northern Plains	Southeast	Delta	United States
			dollars per acre		
Variable costs:					
Seed	8.88	8.24	9.00	10.38	9.14
Fertilizer	4.67	1.30	14.37	5.59	6.50
Lime	.70	.58	2.38	.65	1.00
Chemicals[1]	11.81	6.28	16.24	15.89	13.09
Custom operations[2]	2.18	1.52	4.67	1.89	2.56
All labor	13.00	12.38	14.47	15.38	13.69
Fuel and lubrication	7.90	7.32	9.74	11.63	8.90
Repairs	6.29	5.34	6.86	8.16	6.69
Interest	2.14	1.56	3.37	3.10	2.52
Variable total	57.57	44.52	81.10	72.67	64.09
Machinery ownership:					
Replacement	18.17	14.61	17.69	19.87	18.19
Interest	10.96	9.06	10.24	11.25	10.77
Taxes and insurance	2.67	2.21	2.49	2.67	2.61
Machinery total	31.80	25.88	30.42	33.79	31.57
General farm overhead	7.75	6.79	9.52	9.44	8.34
Management[3]	9.71	7.72	12.10	11.59	10.40
Cost per acre, excluding land	106.83	84.91	133.14	127.49	114.43
			bushels per acre		
Average yield	35.3	30.3	25.9	27.9	31.9
			dollars per bushel		
Cost per bushel, excluding land	3.03	2.80	5.14	4.57	3.59

[1] Includes herbicides, insecticides, and rodenticides not otherwise included under custom operations. [2] Includes custom application of crop chemicals, the cost of chemicals in some cases, and custom harvesting and hauling. [3] Based on 10 percent of above costs.

in fact, growers in all regions but the lake states and Corn Belt had lower costs per bushel in 1979 due to yield gains that outstripped rising production costs.

Yields in the lake states and Corn Belt—while still the highest in the nation—rose only 5 percent in 1979, but yields grew 20 percent in the Delta states, 19 percent in the Northern Plains, and 16 percent in the southeast.

Lake states and Corn Belt soybean growers—who raise over 60 percent of the U.S. soybean crop—usually have the lowest per-bushel costs, but farmers in the Northern Plains had that distinction in 1979.

Costs per bushel fell for Northern Plains producers from $2.87 in 1978 to $2.80 in 1979, while they rose from $2.72 to $3.03 for farmers in the lake states and Corn Belt.

Cotton Growers Buck Higher Cost Pattern

In 1979, cotton growers were alone among producers of the major crops in having lower U.S. average costs per pound than in 1978.

Although costs per acre rose 17 percent, yields leaped 31 percent nationwide. As a result, the average cost of producing a pound of cotton lint fell from 67 cents in 1978 to about 60 cents in 1979.

All regions experienced higher yields last year, and all but the southeast has lower production costs per pound. Yields rose only 6 percent in the southeast, not sufficient to offset a 12-percent rise in costs per acre.

Because of the intensive use of irrigation in the southwest, per-acre production costs were highest there at $611 in 1979. However, with yields almost double the national average—at 1,0

pounds per acre—southwestern cotton farmers still had the second-lowest cost per pound—61 cents.

Costs per acre were by far the lowest in the Southern Plains at $197. And even though this region continued to trail the others in cotton yields per acre, it still scored lowest in per-pound costs at 55 cents.

The southeast, with the second-highest costs per acre and the second-lowest yields, ended up 1979 with the highest cost per pound. At 82½ cents a pound, cotton production in the southeast was nearly 20 cents more expensive last year than in the Delta states—the next most expensive region having a cost of 64 cents a pound.

Peanut Story Varies with Yields

Peanut growers in the three major production regions faced vastly different cost changes in 1979 because of varying yield performance. Nationally, costs per acre rose 13 percent over 1978.

However, yields fell 19 percent in Virginia and North Carolina, pushing per-pound costs up 39 percent. In the southeast, yields inched up only marginally, leaving costs per pound up 13 percent. And in the Southern Plains, yields soared 20 percent, offsetting a 15-percent rise in costs and causing per-pound costs to fall 4 percent from 1978.

In 1979, costs per acre were highest in the southeast at $471 and lowest in the Southern Plains at $335.

Compare Your Own Costs of Production

It may be interesting to compare your own production costs with those reported in this article, which are regional or national averages. However, keep in mind the inherent limitations in such comparisons.

The USDA estimates are designed as indicators of average costs and are not intended to set optimal cost standards. There are many factors besides managerial skills that affect costs, and your costs may vary from the averages for such reasons as climate and soil type.

Also, your costs will vary considerably from the average for irrigated crops (sorghum, for example, when much of the crop is grown on dryland) and for double-crops such as soybeans.

Of course, there are many ways of allocating costs. The following will help you understand our procedures and make your estimates more meaningful when comparing them with USDA's.

Most of the custom operations costs are for harvesting, the remainder for application of chemicals and fertilizers. Many farmers don't have a basis for reporting a separate charge for pesticides and pesticide applications.

Our cost estimates for barley, sorghum, and wheat include the cost of tillage operations for summer fallow. For soybeans, the average costs include those of double-cropped soybeans.

Cotton costs include the extra tillage costs associated with skip row planting. An adjustment was made to reflect the acreage of land required per acre of cotton. This varied from a high of 1.26 acres for the dryland areas of Texas to a low of 1.01 acres in California and Arizona.

Unless you have a more accurate method of accounting for your machinery ownership costs, an approximation of the methods we used would be to assume 8 years as the useful life of machinery. For multi-enterprise farms, allocate this cost according to hours of use on each crop. Also, be sure to figure your interest and insurance charges on machinery (our estimates assumed interest as charged by production credit associations).

Unless you hire an outside manager, pay yourself whatever you like as manager of your own farm. The USDA estimates figured management charges as 10 percent of the estimated variable, machinery ownership, and general farm overhead costs.

If you use the accompanying form, you may want to figure your costs on a per-acre basis—the same way that costs were presented in our tables. You may also want to calculate your costs per bushel by dividing each per-acre cost item by your actual or estimated yield.

Your Costs of Production

Crop: _____

	1978	1979	1980
Variable costs:			
Seed			
Fertilizer			
Lime			
Chemicals			
Custom operations			
All labor			
Fuel and lubrication			
Repairs			
Drying			
Purchased irrigation water			
Interest			
Other _____			
_____			
Total variable costs . .			
Machinery ownership costs:			
Replacement			
Interest			
Taxes and insurance			
Total machinery ownership costs . . .			
General farm overhead			
Management			
TOTAL, all costs excluding land . . .			

Farm Exports Green Up U.S. Economy

Farmers aren't the only ones who benefit from foreign sales of U.S. agricultural products, according to USDA economist Gerald Schluter.

Farm exports also add jobs and money to the rest of the U.S. economy which, in the grip of a recession, is now in need of both.

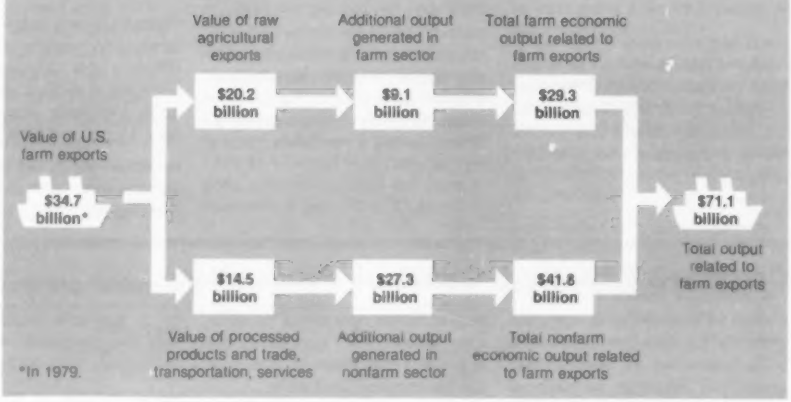
Those who process, package, store, transport, and market U.S. agricultural goods for shipment abroad all reap obvious benefits from farm exports, Schluter says.

However, the success of U.S. farm products overseas is equally important to those sectors of the economy that manufacture, transport, and sell the fuel, fertilizer, farm machinery, and other inputs needed to produce the farm goods.

With more than 60 percent of U.S. wheat and cotton, half of our soybeans, and nearly a third of our corn going into overseas markets, the overall economic impact is considerable.

"Farm exports are vital to the economic health not only of U.S. farmers but of many U.S. industries and the nation as a whole," he says.

Farm Export Impacts Flow Through U.S. Economy


Value of raw agricultural exports
Additional output generated in farm sector
Total farm economic output related to farm exports
$20.2 billion
$9.1 billion
$29.3 billion
Value of U.S. farm exports
$34.7 billion*
$71.1 billion
Total output related to farm exports
$14.5 billion
$27.3 billion
$41.8 billion
Value of processed products and trade, transportation, services
Additional output generated in nonfarm sector
Total nonfarm economic output related to farm exports
*In 1979.

One Million Jobs

Schluter traced the impact of 1979's agricultural exports through the U.S. economy. In the area of employment, he found that more than 1 million full-time jobs were related to exports last year. Of these, nearly 500,000 workers—15 percent of the farm labor force—were employed in the production of agricultural commodities for export.

In the nonfarm sector, more than 630,000 jobs were directly or indirectly related to assembling, processing, and distributing products for export. Around 60,000 of these were in food processing, 300,000 in trade and transportation, 120,000 in other manufacturing sectors, and 150,000 in related services.

Earnings from farm exports are also widely shared throughout the economy. Last year's sales were worth $34.7 billion, of which the farm value of raw agricultural exports totaled $20.2 billion, and the value of processed products, transportation and trade, and other services accounted for the remaining $14.5 billion. In other words, for every dollar in farm sales abroad, the farmer got about 58 cents and 42 cents went to other sectors of the economy.

Multiplier Effect

On top of this, because money earned through farm exports generates additional spending power, it ignites a multiplier effect through the rest of the economy. For example, a dollar earned from foreign sales may be used to buy fertilizer, a pickup truck, a refrigerator, or other goods produced in the U.S.

More than one million full-time jobs were related to U.S. agricultural exports last year, and more than half of these were outside the farm sector.

In this way, each dollar received from agricultural exports in 1979 actually added $2.05 to the U.S. economy, Schluter estimates. Consequently, the $34.7 billion in farm export sales last year resulted in around $71.1 billion in total U.S. business activity.

The additional $36.4 billion was richly scattered through many areas of the

economy—an estimated $9.1 billion went to farmers through farm-to-farm transactions, and $27.3 billion went to other sectors: $2.8 billion to food processors, $11.3 billion to other manufacturing sectors, $3.2 billion for trade and transportation, and $10 billion for various other services.

Nearly 75 cents of every additional dollar generated in the U.S. economy by agricultural exports benefited the nonfarm sector.

What About Imports?

Even with agricultural imports considered, the additional business activity yielded through exports, in most cases, easily offset the potential output lost by importing agricultural goods, although some of these goods compete directly with U.S. products.

Looking at both the total economic output produced by farm exports and the total economic output lost to farm imports, agriculture added a net of $39 billion to the economy—$71 billion of total output generated by farm exports less $32 billion of output lost due to the direct and indirect effects of agricultural imports. All sectors—both farm and nonfarm—benefited except for the food processing sector. There, the influx of foreign processed foods led to the loss of nearly 1,200 potential jobs last year.

The food processing sector gained from 1979 agricultural trade in the areas of meat, grain, and fats and oils processing. However, the balance was not favorable to dairy plants, sugar mills, canners, freezers, confectioneries, and bakeries which suffered the bulk of the job loss.

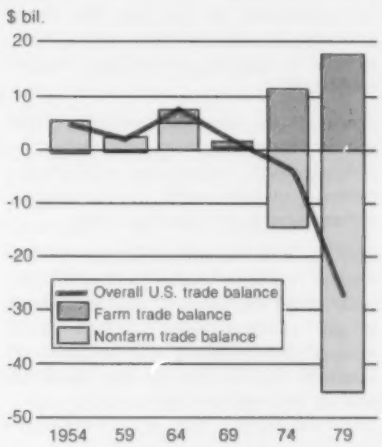
Farm Surplus Cuts Nonfarm Deficit

Agricultural exports have also proved increasingly important to the overall U.S. balance of trade. Net exports of U.S. farm products (exports minus imports) rose from nearly $1 billion in 1969 to over $18 billion in 1979.

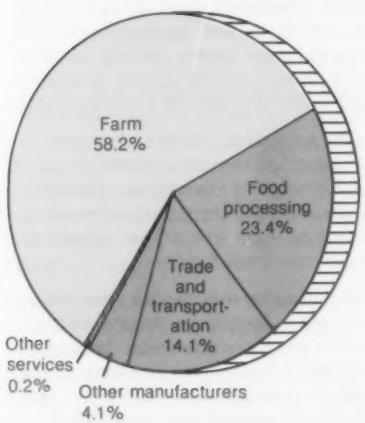
In 1979, the agricultural trade surplus cut a big chunk off the $45.5 billion deficit in nonfarm trade, leaving the overall U.S. trade deficit at $27.5 billion.

Back in the early 1950's, it was the other way around. Agricultural trade was running at a deficit and nonagricultural trade was in surplus. However, the spiraling costs of imported oil, rising food demand in foreign countries, and increased production by U.S. farmers reversed the situation.

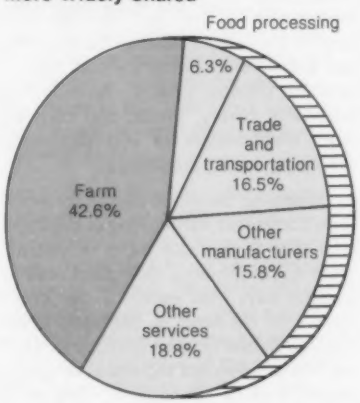
Rising Farm Trade Surplus Helps Stem Growing Nonfarm Trade Deficit



While Direct Effects of Agricultural Exports Favor the Farm Sector . . .



. . . The Total Income Generated Is More Widely Shared



Top Contenders for Productivity Breakthroughs

Where will the next breakthroughs in agriculture research come?

USDA scientists identify 12 emerging technologies as having the most promise for increasing farm productivity in coming years (see August *FARMLINE*).

Among these, however, scientists single out only three as having potentially "unprecedented" impacts on productivity: twinning in beef cattle, photosynthetic enhancement, and bioregulation.

USDA's Sherrill Echpernkamp, of the Animal Research Center at Clay Center, Nebr., says his aim is to enable farmers to get multiple births in beef cattle through the breeding and selection of livestock for twinning genetic traits, as well as through multiple ovulation using hormonal control and embryo transfer.

In 1976 he began a 15-year project of trying to assemble a herd of 180 cows that have produced two sets of twins by 7 or 8 years of age. Of the 26 cows assembled so far, 20 percent have had twins. Encouraged by the results, Echpernkamp says the selected cattle have come through with flying colors.

Echpernkamp points to the success of twinning in the sheep industry. At first, twin lambs tended to be weaker than singles at birth. Within the last 10 years, however, the introduction into the U.S. of the prolific Finn breed has boosted the incidence of equally strong twins. Crossbreeding has produced superior females.

Similar results with the domestic Suffolk breed (1.8 lambs per ewe) has helped to convince the sheep industry about the value of twinning. Popular because of its growth characteristics and superior muscling, Suffolk is the main sire breed for market lambs.

Natural and synthetic bioregulators can increase crop production, enhance ripening, prolong shelf life of fruits and vegetables, and reduce cooling costs.

Photosynthetic Enhancement

"Without photosynthesis there is nothing," says Gerald Carlson, USDA staff scientist at Beltsville, Md.

USDA is now seeking ways to boost the growth rate of crops by improving photosynthesis—the process through which plants form carbohydrates and absorb nitrogen for protein synthesis.

The more sunlight absorbed, the faster protein is produced and the greater the plant growth rate. Plants naturally use only 1 to 3 percent of sunlight available.

Growth regulators and hormones are creating physical changes in plants which improve collection of sunlight. Scientists have changed the plant structure of corn, for example, so that more leaf area is exposed to the sun, thus improving photosynthesis. Already new breeds of barley, wheat, and corn with more erect leaves for sun interception are being widely harvested.

By breeding selected plants, scientists have controlled partitioning of the sugarbeet root to produce more recoverable white sugar per acre. One plant breeder, Carlson says, has seen a 7-percent increase in his crop, a dramatic breakthrough in this long-term study where "if we had a 1-percent increase per year or even every 5 years, we'd be delighted."

Bioregulation

Bioregulation means the use of natural and synthetic chemical regulators to increase crop production, enhance ripening, prolong shelf life of fruits and vegetables, and reduce cooling costs.

"We are looking for natural chemicals that affect the growth of plants," says USDA research coordinator George Steffens, noting that natural regulators are less likely to have harmful environmental consequences than manmade chemicals.

This technology promotes flowering, controls preharvest drop of fruits, and hastens ripening. Bioregulators can also be used to slow grass growth, retard sucker growth in tobacco, and stop sprouting of potatoes and onions.

In one 3-year project, scientists used 500 pounds of pollen to identify an extract, equal to a few grains of salt, that produces rapid growth in a variety of plants. The chemical, when applied to the eyes of seed potatoes, has increased the number of potatoes harvested by as much as 24 percent, according to USDA plant physiologist Luis Gregory.

Inhibits Growth

Another fruit of recent research is the discovery of a chemical from a Chinese tree that can be used to modify other plants. The chemical, Camptothecin, discovered in the course of cancer research, can inhibit rooting of bean plants, grass growth, potato sprouting, and growth of tumors in soybean plants.

Steffens predicts the use of growth inhibitors such as Camptothecin as a replacement for herbicides. Using the no-till method of crop production, for example, farmers could use growth inhibitors on a hay field.

It would leave only the hay stubble on the surface, but leave the live roots to protect against soil erosion. This would provide a more favorable planting ground for next year's corn than a location stripped of all vegetation by herbicides.

Growing the Crops of Tomorrow

How will the crops of tomorrow grow?

USDA economist Leroy Quance signals a significant trend: "We're becoming less dependent on land as the limiting factor in productivity."

In a scene rivaling science fiction, University of Arizona scientists are tending a bizarre-looking collection of crops that portend a new future: crops without soil.

Dirtless crops

Crops are growing without soil in a lab greenhouse. Specimen heads of lettuce grow out of chunks of styrofoam that float on a small pond. The roots dangle dirtlessly in nutrient-enriched water.

Spinach, tomatoes, and lettuce grow on slanted A-frame boards. Their roots, hanging freely below the boards, are misted with a nutrient solution. Crops produce twice the yield they would on horizontal surfaces.

Two or more crops are being grown on the same plot—lettuce on styrofoam, melons above on A-frame, all over catfish-stocked ponds. When the lettuce is harvested and the styrofoam removed, the melon vines are shaken and the fruit falls into the water for easy harvest.

Then there's lettuce-in-a-futuristic-drum. The plants are set in holes in a drum which spins at 50 rpm, to simulate Earth's gravity. As the drum spins, the effect is like extra-terrestrial farming at a revolving space colony. The plant tops grow toward artificial sunlight tubes at the center, and the roots, flaring outward, are misted regularly with a nutrient solution.

Crops like corn, cucumber, and soybeans are also being grown in sand instead of soil, irrigated with a nutrient-rich solution containing nitrogen, phosphorus, potassium, calcium, zinc, iron, and copper.

Exploiting halophytes

Salt-tolerant plants (halophytes) are being grown on desert farms in Mexico. Irrigated with salt water, one plant, the "pickle weed" that produces the highest yield per acre of any halophyte tested, has a protein content between wheat and soybeans. They thrive in the hot, strong desert sun.

Lettuce is growing out of chunks of styrofoam, its roots hanging dirtlessly in nutrient-enriched water.

Similar plants will also thrive on croplands unsuitable for conventional agriculture. Research is underway to evaluate these plants as forage for cattle. Already the "salt bush" has proven to be directly digestible by goats and chickens.

These revolutionary agricultural techniques are part of a $55 million exhibit anticipating the future of agriculture. Scheduled to go on permanent display at Walt Disney World in Florida in October 1982, "it will have a tremendous impact on the image of agriculture in the eyes of the general public," according to Merle H. Jensen, horticulturist at the University of Arizona's Environmental Research Lab (ERL) in Tucson.

Devised and tested by ERL, the crops will be part of a planned Experimental Prototype Community of Tomorrow. ERL is best known for controlled-environment greenhouses for high volume vegetable production in coastal and inland deserts of the world.

The basic concept combines greenhouse plants with open-field crops. For example, tomatoes and cucumbers have been cultured for years in nutrient-rich sand beds of controlled environment greenhouses. Beside them are plants such as rice that won't usually grow in sand, and plants no one has ever grown before, such as halophytes.

New World

The research means a whole new world of agriculture and aquaculture, according to Carl Hodges, director of ERL. "New agricultural lands will come into production on the land and in the sea," Hodges says. "There may be farms floating on the ocean."

Underlying Hodges' dream is the knowledge that his work must be rooted—if not in dirt—at least in the real world. Farming decisions will be based on economics.

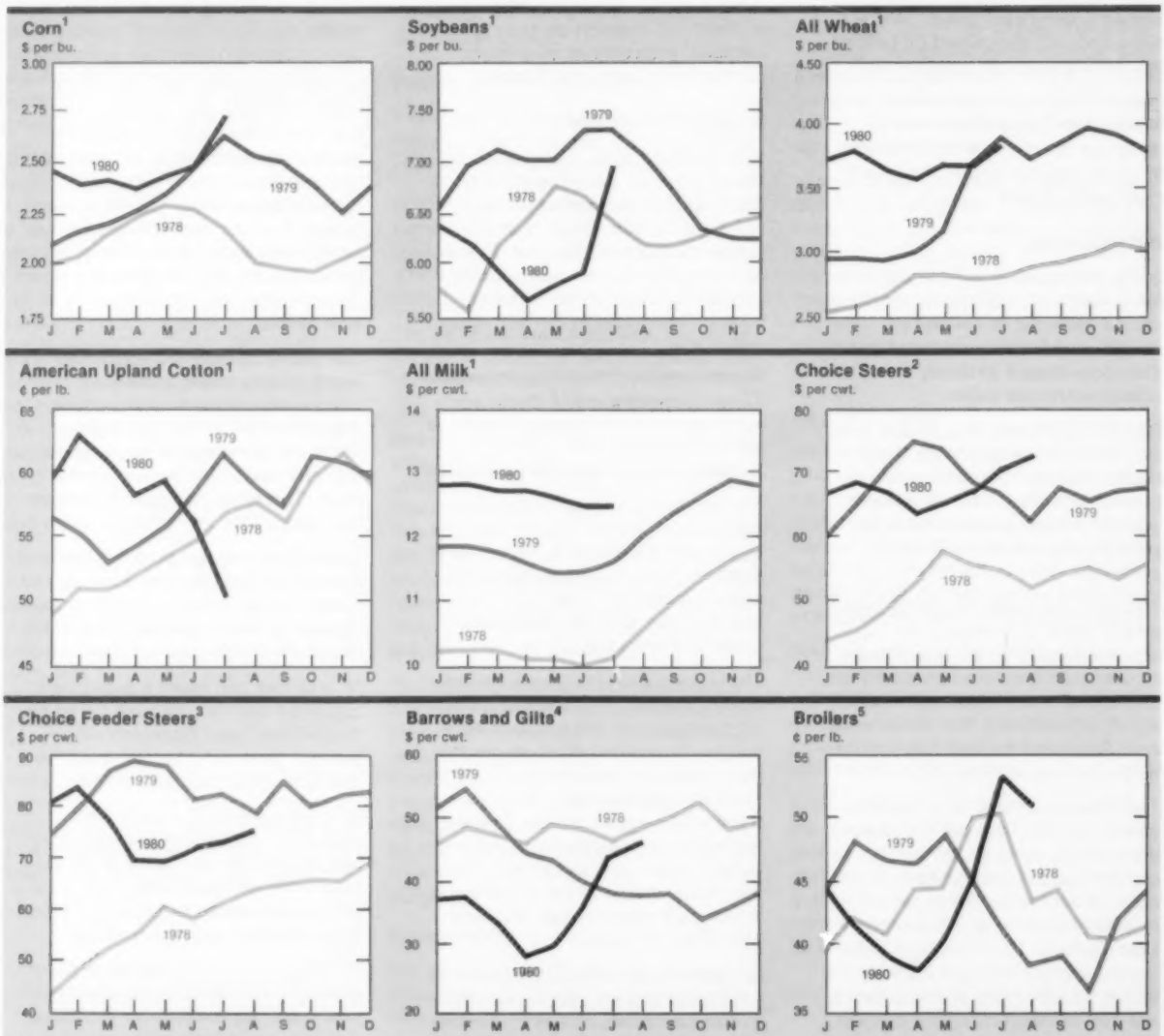
"If a farmer can make a profit, he'll adopt the system," he says. "A lot of things have been promoted which farmers have not adopted, because they just weren't profitable."

At Disney World, the exhibit will always be testing and demonstrating new techniques of interest to agriculture, from nitrogen-fixing organisms and genetic manipulation of plants, to tissue cultures and aquaculture.

The long-term goal is development of entirely closed agricultural systems—with profit uppermost—for increased and pollution-free food production.

Monthly Price Monitor

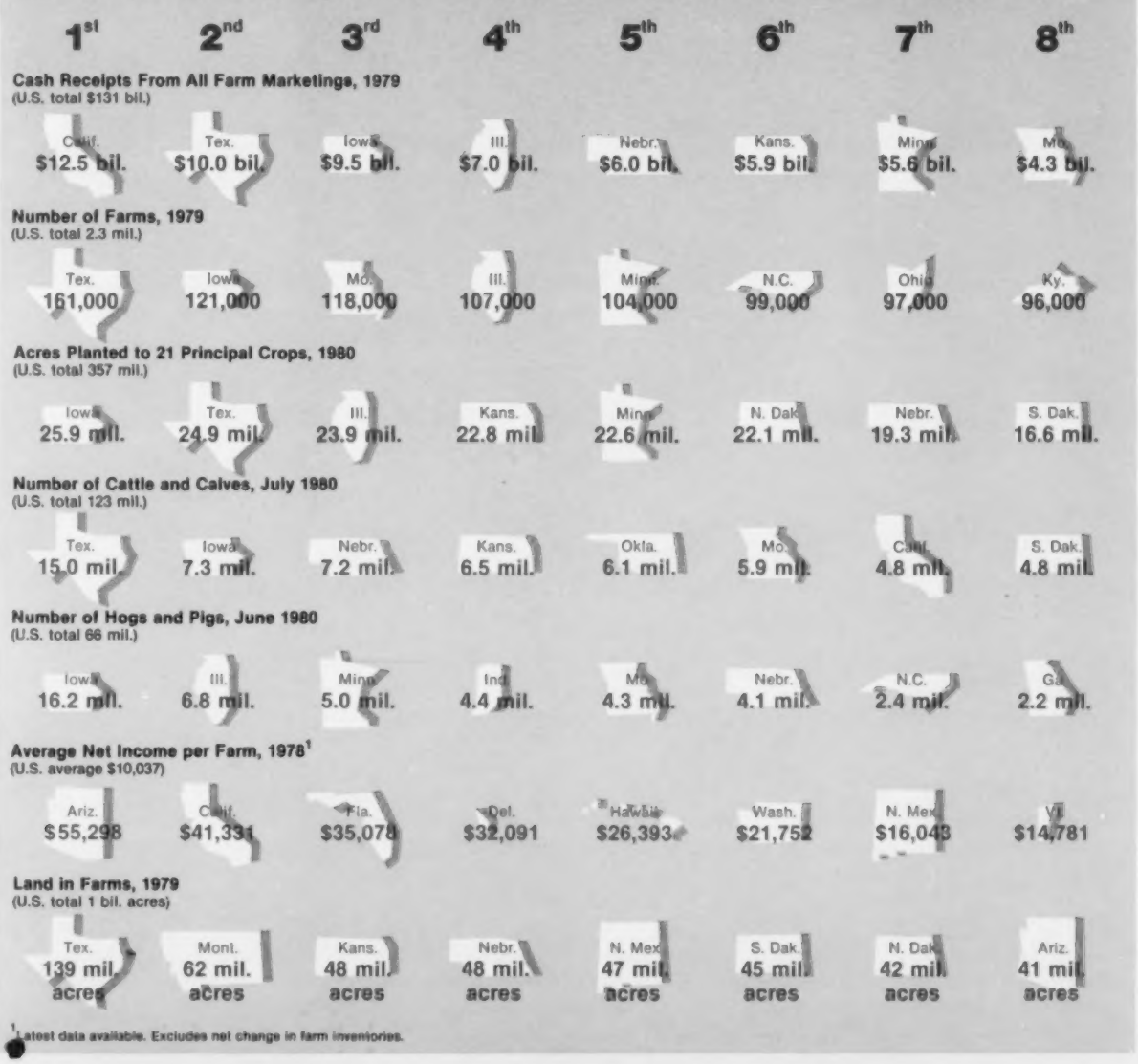
Farm prices for soybeans, corn, and wheat were jumping from June to mid-July, while cotton prices dropped. The soybean price rise was more than a dollar a bushel, and U.S. average corn prices reached their highest in 4 years. Except for broilers, livestock also showed further price strength, though feeder steers were still earning less than a year ago.



[1]U.S. average prices received by farmers. [2]Omaha. [3]600-700 lbs., Kansas City. [4]Seven-market average. [5]Wholesale, New York.
Prices for the latest month shown are mid-month or first week averages.

Cream of the Crop

Which are the top farm states? It all depends on the measure. For milk, Wisconsin is cream of the crop. For pineapples, Hawaii is top seed. Below are a few of many possible measures of the leading farm states. Although Iowa, Texas, and some others are most prominent in the rankings, two dozen different states are represented among the top eight in at least one of the following categories. That's testimony to the diversity and strength of American agriculture.



[1] Latest data available. Excludes net change in farm inventories.

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